

Coaching for Survival: The Hazards of Head Coach Careers in the German "Bundesliga"

Barros, Carlos Pestana; Frick, Bernd; Passos, José

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**Coaching for Survival: The Hazards of Head Coach Careers in the German
Bundesliga**

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Coaching for Survival:

The Hazards of Head Coach Careers in the German “Bundesliga”

Abstract

This article analyzes how long head coaches survive in the clubs of the first German football league (“Bundesliga”), where the dismissal of a presumably weak coach is a generally adopted procedure in case of a poor sporting performance of the team. We use duration models for repeated events to accommodate the correlation within individuals. We find that the head coaches of successful teams and those working during the more recent “Bosman Effect” period are more likely to survive in the Bundesliga. Moreover, the head coaches of clubs with relatively high team wage bills are likely to survive for shorter periods of time.

Keywords: Duration Models, Head Coach Dismissal, Soccer, Bundesliga, Germany

JEL-Code: L83, M12, M51

1. Introduction

The empirical study of head coach career duration in professional football can benefit from the application of event history analysis, a technique that focuses on the effects of factors that determine the length of time until the occurrence of some event, such as the death of a patient or the dismissal of an employee Yamaguchi (1991), Allison (1984), Cleves, Gould and Gutierrez (2002), Cox and Oakes (1984). This technique has been previously used in sports by Okhusa (1999, 2001) and Frick, Pietzner and Prinz (2006) and is currently being adopted elsewhere in fields such as labour economics (Carrasco 1999; Tribó, 2005; Cueto and Mato, 2006; Collier, 2005; Haurin and Sridhar, 2003; Gonzalo, 2002), in international relations (Box Steffensmeier, Reiter and Zorn 2003; Barros, Passos and Alana, 2005), corporate finance (Holtz-Eakin et al. 1994, Orbe, Ferreira and Núñez Antón, 2002; Leung, Rigby and Young, 2003) and industry (Requena-Silvente and Walker, 2005).

In this paper we analyze the determinants of head coach career length using a hitherto unavailable data set from the “Bundesliga”, the first division in German football.

The motivation for this research is the following: First, coach dismissals have always been and still are used occasionally when (professional) teams perform poorly on the pitch. However, dismissing the old and hiring a new head coach not necessarily leads to positive results. It is, therefore, important to ascertain the covariates which explain the decision to dismiss a coach. Second, a dismissal is a decision in time which in an individual coach’s career happens once in a while - possibly depending on the duration of his career in the league. This time event characteristic of career length and dismissal allow their analysis using an event history model. Finally, it is important for policy purposes to investigate the covariates of head coach dismissals. If one knew the characteristics leading to these events, then one could better allocate resources used in countering such events.

The paper contributes to the theme’s literature in three ways. First, by adopting a panel data framework, it uses a hazard model, previously applied by Okhusa (1999, 2001). A Repeated events duration model is adopted. Second, it specifically analyzes head coach dismissals, an issue that so far has not inspired much research in Europe, despite its increasing importance, allowing for salary information. Finally, it analyzes data from one of the major European football leagues which, in turn, allow some broader generalizations.

This paper is organised as follows. In section 2 we summarize the literature that is of relevance in our context. Section 3 describes the contextual setting, i.e. the labour market for head coaches in German soccer. In section 4 we present the theoretical

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framework that underlies the empirical analysis, in section 5 the data and in section 6. the results. Section 7 discusses the limitations and some possible extensions of our research and, finally, section 8 concludes.

2. Literature Survey

The number of papers adopting event history analysis in (professional) sports has been increasing considerably over the past few years as more and more data has been made available. Spurr and Barber (1994) analyze the promotion, demotion and turnover of pitchers in minor league Baseball in the US in the years 1975-1988 using the Weibull model, the Gompertz model and the quadratic model, identifying the variables that were more important in predicting promotion, demotion and turnover. Hoang and Rascher (1999) study exit discrimination in the NBA during the 1980s concluding that white players had a lower risk of being cut than black players. Atkinson and Tschirhart (1986) identify individual player determinants of career duration in the NFL (1971-1980) with Cox, Weibull, Exponential and Burr-type model, using data on injuries, individual and team performance, education, and player position. Ohkusa (1999, 2001) analyzes the quit decision among baseball players in Japan with Cox's proportional hazard model. Del Corral, Barros and Prieto-Rodriguez (2007) analyse the pattern of player substitutions during a soccer match, using data from the Spanish First Division football League in the 2004-2005 season.

More in line with the present research, a number of studies look at the impact of firing the head coach on team performance in various European soccer leagues: Tena and Forrest (2006) examine the consequences of within-season dismissals of head coaches in the "Primera Division", the top division of Spanish football, in the seasons 2002/03-2004/05 with an ordered probit model. Koning (2003) uses data from the first Dutch division, covering the period 1993/94-1997/98 with a Poisson model. The study conducted by Bruinshoofd and ter Wel (2003) also uses data from the first Dutch division, but covers an even longer period of time (12 seasons, 1988/89-1999/00) using differences-in-differences estimator. Poulsen (2000) uses data from the first two divisions in England, covering the seasons 1993/94-1997/98. Audas, Dobson and Goddard (1997, 2002) cover 21 and 28 consecutive seasons (1972/73-1992/93 and 1972/73-1999/00 respectively) and look at all four division of British professional football with an ordered tobit model. Breuer and Singer (1996) use data from 32 consecutive seasons from the German first division (1963/64-1994/95); the study by Salomo and Teichmann (2000) also uses data from the Bundesliga, but covers a slightly

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different time period (1978/79-1997/98). Finally, Braendle (2005) uses data from ten consecutive seasons from the first division in Austria (1994/95-2003/04).

Using data from two of the four Major Leagues in the US (Baseball, 1901-1989 and Basketball, 1949/50-1989/90, Scully (1992a, 1992b, 1994) finds that firing the manager is rational in the sense that clubs improve their rank order finish the season after the head coach had been fired. Borland and Lye (1996) analyze coach separations in Australian rules football over a period of more than sixty years (1931-1994).

Mixon and Trevino (2004) and Kahn (2004) study the impact of race on the career duration of head coaches in college football and in the NBA, respectively.

The influence of either managerial quality or managerial efficiency on team performance is studied by Porter and Scully (1982) using data from MLB (1961-1980), Kahn (1993) also using major league baseball data (1969-1987), Fizel and D'Itri (1997) using data from 147 US-college basketball teams over the period 1984-1991, Horowitz (1994) again using MLB data for the period 1903-1992. Jacobs and Singell (1993) as well as Singell (1993) analyze data from Major League Baseball (1945-1965). Idson and Kahane (2000, 2004) analyse the salary determination in USA national Hockey League. Finally, Frick and Simmons (2005) study data from the German Bundesliga (for a description of the data set see below) and McCormick and Clement (1992) rely on data from the NBA (1980/81-1986/87).

Focusing on survival models, it is verified that they are common in several fields of research, but coach survival is a rare issue, Audas, Dobson and Goddard (1999), Audas, Goddard and Rowe (2006). Moreover, while these paper adopt matching results and coach age, they do not include coach salary and team salary, which may be an important predictor of survival.

3. The Labour Market for Head Coaches in German Football

In all but one of the 22 seasons for which we have been able to compile the data used in this paper (see below) 18 teams were playing in the German first division ("Bundesliga"). At the end of each season the three weakest teams are relegated and replaced by the three best-performing teams from the second division¹.

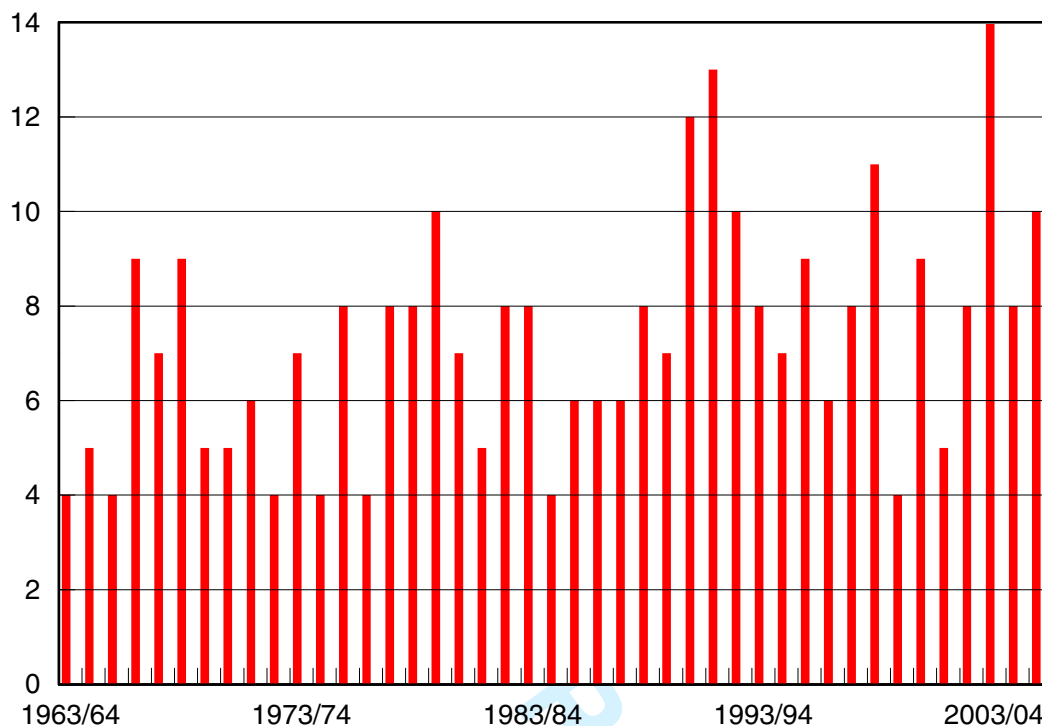
In the history of the Bundesliga more than 300 head coach dismissals have been recorded. The annual number of dismissals varies between 4 and 14. While some

¹ In 1991/92, when the two best teams from the first division of the former German Democratic Republic ("Oberliga") were admitted to the Bundesliga, the number of teams was temporarily increased to 20. After that season, four teams were relegated to division 2 while only two were promoted to division 1, resulting in the well-known size of the league again.

coaches have been working for one team only, others have been employed by as many as seven different clubs².

Figure 1

Number of Head Coaches Dismissed per Season (1963/64-2005/06)



Source: Kicker, special issue „40 years of Bundesliga“, p. 198-200; Kicker Finale 05/06

Our analysis, however, concentrates on the period 1981/82-2002/03 since we have information on head coach salaries for these 22 consecutive seasons only. Coaching in the Bundesliga is similar to other European football leagues, but the relative importance of this league at European level make it a representative case study. Dismissal is the termination of a contract of employment. It can be by mutual agreement or with litigation. As coaches are one of the main important managers in football the analysis of their dismissal in a sport league is an important issue for sport labour market policy.

2 Otto Rehhagel, currently head coach of the Greek national team, was formerly employed by Kickers Offenbach, Werder Bremen, Borussia Dortmund, Arminia Bielefeld, Fortuna Duesseldorf, Bayern Muenchen and 1. FC Kaiserslautern. Moreover, a number of head coaches had up to six different employers in the first division (Guyla Lorant, Joerg Berger, Rudi Gutendorf, Kuno Klotzer, Manfred Krafft and Branco Zebec). Some of these coaches have not only been working in the first, but also in the second division. Moreover, some coaches have been working for a team not only once, but have been hired again after a while.

4. Theoretical Framework

The focus of this paper is on football coaches in the German Bundesliga in the years 1981/82- 2002/2003. The length of a football coach's career depends on three critical factors: The individual's football specific skills and the characteristics of the local labour market (preferences for a certain type of football are likely to differ between the clubs in a league) are certainly important. What is of prime importance, however, is the head coach's performance, i.e. his win percentage in a particular job.

The hypotheses to be tested in the empirical part of our paper are as follows:

H1: The relative salary of a head coach determines his career length. Coaches with relatively high salaries are more likely to remain in their position even in case of poor performance, because the opportunity costs of replacing them are quite high. This hypothesis will be tested with the variable *Rsal*-relative salary of head coach

Previous research has already tested this assumption (see Dawson, Dobson and Gerrard 2000, Porter and Scully 1982). We are, however, the first to use detailed salary information over a long period of time for the Bundesliga.

H2: The career length of the coaches is also determined by the relative wage bills of their teams. We assume that coaches working with expensive teams, i.e. those with relatively high wage bills, are more likely to be fired when performance lags behind expectations. This hypothesis will be tested with the variable *RWB*-relative wage bill of the team.

It is one of the few "stylized facts" in the sports economics literature that expensive teams are performing better than clubs with moderate or even low wage bills (see Szymanski 2003, Forrest and Simmons 2004).

H3: There is a positive trend for the career durations of head coaches, i.e. the probability of being dismissed has decreased over time. This hypothesis will be tested with the Bosman effect variable.

Although competitive pressures have increased for the players following the "Bosman verdict" of the European Court of Justice (see Frick, Pietzner and Prinz 2006), the globalisation of the European football industry has not yet affected head coaches in

Germany. The number of foreign coaches is low and dismissed coaches can expect to be re-hired soon by another team.

H4: Career duration of head coaches in football is positively affected by their win percentage, i.e. their career length increases with the number of relative points won by their teams. This hypothesis will be tested with the variable CWP –win percentage of the head coach and RP-relative point won.

Coaches are constantly monitored not only by the management of their clubs but also my millions of football fans. Since the coaches are responsible for the teams' performance on the pitch, more successful coaches are likely to survive longer.

H5: Coaching experience increases the probability of surviving in the current job. The longer a coach has been working in professional football, the more human capital he has accumulated which, in turn, reduces the probability of getting fired. This hypothesis will be tested with the variable CEXP-experience of head coach in the Bundesliga.

In one of his seminal publications Mincer (1974) analyzed the relationship between experience and earnings showing that career length is a good predictor of current income (this relationship, however, is not a linear one).

5. Research Design

In the study of the career durations of head coaches in German professional football the event we want to explain is the dismissal, i.e. the premature end to an employment relationship. A dismissal can either mean that the coach has to end his career or that he is later on re-employed by another team. Many of the coaches whose careers we study have held a number of different jobs in the Bundesliga. Since such repeated events are unlikely to be independent the Cox proportional hazard model for single event data is inadequate for estimation, Kalbfleisch and Prentice (2002). Ignoring this dependence might lead to erroneous variance estimates and possibly biased estimates. One possible solution to this problem is considering only the time until the first occurrence of an event. This specification, however, makes the strong assumption that the time to the first event is similar to the time to all events. Moreover this specification implies throwing away some data.

Some semi-parametric proportional hazard-type models have been proposed in the literature to be used in case of repeated events, such as the independent increments model of Anderson and Gill (1982), the conditional risk-set model in either elapsed or gap time of Prentice, Williams and Peterson (1981), and the marginal risk-set model of Wei, Lin and Weissfeld (1989). All these models are variance-correction models for repeated events and differ in the way they define the risk set and the event time, e.g., Box-Steffensmeier and Zorn (2002).

In this paper we use the conditional risk-set model in gap time developed by Prentice, Williams and Peterson (1981). In this model, an individual is not at risk for a later event until all prior events have occurred and event time is defined as time elapsed since the previous event. To estimate this model we cluster on coach identification and stratify by event number. The hazard is then specified as

$$h_{ik}(t | X_{ik}) = h_{0k}(t - t_{k-1}) \exp(\beta X_{ik})$$

where k denotes event number, $h_{0k}(\cdot)$ is the baseline hazard and varies by event number, X is a vector of covariates which can be time dependent and β is a vector of parameters.

The parameters are estimated using the partial likelihood which is given by

$$L(\beta) = \prod_{i=1}^n \prod_{k=1}^{K_i} \left(\frac{\exp(\beta X_{ik})}{\sum_{i=1}^n \sum_{k=1}^{K_i} Y_{ik} \exp(\beta X_{ik})} \right)^{\delta_{ik}}$$

where δ is a censoring indicator equal to one if observed and zero if censored and Y is a risk indicator which is equal to one if the individual is at risk for the current event and zero otherwise.

We also consider two parametric specifications: the exponential and the Weibull model. In the exponential model the baseline hazard is stratified by event number and is constant at each event k , with hazard rate,

$$h_{ik}(t | X_{ik}) = \theta_k I_k(t - t_{k-1}) \exp(\beta X_{ik})$$

where $I_k(t - t_{k-1})$ is an indicator function for durations in event k and θ_k the estimated baseline at event number k .

In the Weibull model the baseline is defined by

$$h_{0k}(t - t_{k-1}) = \alpha_k (t - t_{k-1})^{\alpha_k - 1}$$

where the time dependent parameter, α_k , is estimated separately for each event. Both models are estimated through maximum likelihood.

6. Data and Findings

The data used to study the determinants of head coach career duration cover the seasons 1981/82-2002/2003. The data come from a Sunday newspaper (*Die Welt*) that publishes team wage bills and head coach salaries immediately before the start of a season. Supplementary data on team playing records were obtained from *Kicker* soccer magazine. These data give us an unbalanced panel of 398 team-season observations featuring 39 teams. Six of these (Bayern Muenchen, Werder Bremen, Borussia Dortmund, Hamburger Sportverein, Bayer Leverkusen and VfB Stuttgart) have appeared in Bundesliga 1 over the entire sample period; five clubs (Blau-Weiss Berlin, Darmstadt 98, VfB Leipzig, Kickers Offenbach and SSV Ulm) were relegated after just one season. During the period under consideration we observe different 114 coaches. To ensure the validity and reliability of the data, several steps were taken. First, the source data is a reliable German newspaper recognised by its rigour and objectivity. Second, the data was examined by professionals working in the field, namely labour union members, in order to ascertain the reliability of the values. Third, based in this investigation we can discard any falsity or contradictions in the data set concluding that it is consistent. Fourth, the reliability of the data was examined, analyzing it extensively with alternative methods and reaching the same conclusions, Frick, Barros and Prinz (2007). Table 1 presents the characteristics of the data used in the analysis.

Table 1: Characteristics of the Variables

Variable	Description		Min.	Max.	Mean	Std. Dev.
OUT	Binary variable equal to one if coach is dismissed; zero otherwise	dependent variable	0	1	0.450	0.498
RSAL	Relative salary of the head coach (individual salary divided by average salary of all head coaches in respective season)	Variable testing hypothesis 1	0.226	3.079	1.000	0.507
RWB	Relative wage bill of the team (team wage bill divided by average wage bill of all teams in respective season)	Variable testing hypothesis 2	0.230	4.147	1.000	0.533
Bosman effect	Dummy variable equal to one for period where the Bosman effect starts; zero otherwise (from 1995/96 onwards=1 and zero elsewhere)	Variable testing hypothesis 3	0	1	0.362	0.481
CWP	Win percentage of head coach	Variable testing hypothesis 4	0	0.850	0.448	0.194
RP	Relative points won (points accumulated by team divided by average number of points won by average team in respective season)	Variable testing hypothesis 4	0.206	0.779	0.484	0.121
CEXP	Experience of head coach in the Bundesliga measured in years	Variable testing hypothesis 5	0	27	4.369	4.815

Table 2 presents the correlation among the variables

Table 2: Correlation between variables

	RSAL	RWB	BOSMAN	CWP	RP	CEXP
RSAL	1.0000					
RWB	0.6208	1.0000				
BOSMAN	-0.0000	-0.0000	1.0000			
CWP	0.3789	0.2819	0.0136	1.0000		
RP	0.4929	0.5979	-0.1798	0.3225	1.0000	
CEXP	0.4737	0.1672	0.0085	0.4413	0.2773	1.0000

Table 3 presents the results of our estimations. We present a number of different duration models for comparative purposes. The dependent variable is always tenure with the current team, measured in years. The estimated coefficients are always in the proportional-hazard metric.

Model 1 (M1) is the Cox proportional hazard model considering only the first occurrence of an event. Model 2 is the conditional risk-set model in gap time of Prentice, Williams and Peterson (1981). Model 3 is the parametric exponential model with the baseline hazard stratified by event. Finally, Model 4 is the Weibull model where the baseline hazard parameter, α_k , $k=2,\dots,6$, is estimated separately at each occurrence of an event.

Table 3: Estimation Results

	M1		M2		M3		M4	
	Coef.	s.e.	Coef	s.e.(2)	Coef	s.e.(2)	Coef	s.e.(2)
<i>RSAL</i>	0.106	0.293	0.011	0.237	0.009	0.144	-0.334	0.244
<i>RWB</i>	0.815	0.218	0.683	0.183	0.448	0.154	0.623	0.215
<i>Bosman</i>	-0.656	0.217	-0.772	0.156	-0.559	0.109	-0.907	0.193
<i>CWP</i>	0.327	0.531	0.436	0.480	0.310	0.320	-1.001	0.503
<i>RP</i>	-8.493	0.993	-8.415	0.726	-5.801	0.534	-5.725	0.679
<i>CEXP</i>	0.001	0.038	0.030	0.018	0.017	0.016	-0.039	0.026
θ_2					0.023	0.122		
θ_3					0.118	0.139		
θ_4					0.075	0.195		
θ_5					-0.035	0.409		
θ_6					0.723	0.162		
<i>Constant</i>					1.356	0.176	1.519	0.238
<i>Ln(α_2)</i>							0.160	0.086
<i>Ln(α_3)</i>							0.269	0.126
<i>Ln(α_4)</i>							0.373	0.082
<i>Ln(α_5)</i>							0.497	0.152
<i>Ln(α_6)</i>							0.813	0.075
<i>Ln(Const)</i>							0.587	0.089
<i>LL</i>	-369.3		-544.4		-205.3		-159.3	

(1) – All models were estimated in Stata 9

(2) – Robust standard errors

θ_k - baseline parameter for event, $k=2,\dots,6$,

α_k - parameter of the Weibull base line hazard for event $k=2,\dots,6$

LL - Log Likelihood

There are 114 coaches in the sample who are responsible for 179 events and 10 censored observations (models M2 - M4). The frequency of events is shown in Table 3.

Table 4: Frequencies

No. of Events	1	2	3	4	5	6
Frequencies	114	48	20	4	2	1

In all four models the results are quite similar in the main effects. The relative wage bill (*RWB*) has a positive effect in the hazard implying that coaches of more expensive teams tend to be fired earlier, i.e. expectations of management and fans are apparently higher than in teams that spend less money for their players. The sporting performance of the team (*RP*) and the regime shift (Bosman effect, change in labour market regulation of the players) have a negative impact on the hazard rate. This means that coaches playing working under the “Bosman effect” tend to survive longer.

Finally, in model 4 the coaches’ career win percentage is negative and statistically significant. This implies that better (in the sense of more successful) coaches tend to survive longer, too. Moreover, the time dependent parameter of the baseline hazard, α_k , is greater than one for all the occurrences of an event and its value increases with event number, implying that the risk of being fired increases with repeated events. This conclusion, however, should be taken with care because there are only a few observations for recurrent events greater than 3 (recall from Table 3 that only 7 out of 114 coaches experience more than 3 events). Thus, further research using a much larger dataset is required.

7. Discussion

In our paper we analyze the determinants of head coach dismissals in the top tier of the German football league using a number of different survival models. We first have to reject *H1* because the coefficient of *RSAL* has the expected sign, but is not statistically significant. We find support for our *H2* because the respective coefficient is statistically significant, i.e. the coaches of more expensive teams (those with higher values of *RWB*) are more likely to be fired. Moreover, we find that coaches working under the “the Bosman effect” tend to survive longer, leading us to accept *H3*. We also find support for *H4* which suggests that coaches producing more wins (i.e. whose teams have a better

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4 sporting performance) tend to survive longer. Finally, *H5* has to be rejected again,
5 because prior coaching experience has no influence on the probability of surviving in a
6 particular job.
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10 What are the implications of these results? They are, of course, intuitive: Success on the
11 pitch is the major determinant of survival. Head coaches who are able to produce more
12 wins are likely to survive longer. Working with an expensive team makes the coach
13 more vulnerable: Since the team's team wage bill and the management's as well as the
14 fans expectations are highly correlated, a poor performance very often leads to an
15 immediate dismissal (sometimes after a few weeks of the season already). Surprisingly,
16 however, clubs seem not to blame coaches for a poor performance as quickly as they did
17 in the past. In more recent years, coaches tend to survive longer. This outcome may be
18 due to a number of reasons: First, coaching talent may be an even more scarce resource
19 than it used to be (the teams in Germany rarely hire foreign coaches, i.e. the
20 globalization of football has not contributed to an increased inflow of talent as opposed
21 to the market for players). Second, since the salaries of head coaches went up
22 considerably over the last years, it may simply be too expensive to dismiss a head coach
23 with a valid contract. Third, replacing a head coach in the middle of the season may be a
24 difficult task: If the teams at the beginning of the season hire the most able coaches it is
25 clear that those still looking for a job in the middle of the season are, on average, of
26 lower quality. This, in turn, may very often be a reason to keep the incumbent job - the
27 available alternatives are even worse.
28

29 What are the policy implications of our findings? The most important result here is that
30 organizational changes (Bosman Effect) have an impact on the survival of head coaches
31 in the German Bundesliga. Thus, organizational changes should be taken into account
32 when studying head coach departures over time. Head coaches themselves should take
33 into account that although their salary reflects talent, it has no statistical influence on the
34 probability of surviving in the present position. What as an impact, however, is the
35 money spent on player salaries (head coach salaries and team wage bills are only
36 moderately correlated with $r=+0.45$).
37

38 How does our research compare with previous papers that have been published on this
39 topic? Comparing the present results with Audas, Dobson and Goddard (1999) who
40 analysed voluntary and involuntary job termination for English football coaches from
41 1972-19997 and Audas, Goddard and Rowe (2006) who analysed coach departure in the
42 USA National Hockey League from 1967-2002, the sole papers directly comparable
43 with the present one. Common results with Audas, Dobson and Goddard are that the
44 hazard is sensitive to coach age, match results and winning ratio in both papers.
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Therefore we validate previous research in this field. The results of Audas, Goddard and Rowe (2006) are not directly comparable with the present paper. Therefore, while validating previous research we also point out that the salary of the coach and the wage bill of the team are also predictors of coach departure.

8. Summary and Conclusions

In our paper we analyze the survival of head coaches in the first division in German professional soccer over the period 1981/82-2002/03. Using a unique and hitherto unavailable data set with information on team wage bills and head coach salaries we compare the results of different estimations. We estimate, first, a Cox proportional hazard model, second, a conditional risk-set in gap time, third a parametric exponential model and, fourth, a Weibull model. We find that while the salary of the head coach is statistically insignificant in explaining survival, the opposite holds for the team wage bill. Head coach experience as well as the career win percentage are statistically insignificant. Finally, organizational changes matter in the sense that the adoption of the Bosman effect” had a positive influence on the survival probabilities of head coaches.

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